AMERICAN
JOURNAL OF SURGERY

VOL. XXXIII. OCTOBER, 1919 No. 10

ARTERIO-VENOUS ANEURISMS AND ARTERIAL SUTURE.*

RAYMOND GREGOIRE.

Professeur agrégé à la Faculté de Medicine de Paris; Chirurgien des Hôpitaux de Paris.

During the last few years, a large number of cases of arterio-venous aneurisms have been published, from which it can be concluded that the treatment commonly applied to this condition has been the quadruple ligature with or without extirpation, according to the case. In the very small number of cases in which the reestablishment of the arterial circulation has been attempted, it was unusual that the surgeon had planned this when the operation was begun. More often he was led to the latter procedure by unexpected opportunity.

The ideal treatment for arterio-venous aneurisms is undoubtedly that which abolishes the arterio-venous communication, and at the same time conserves the physiological integrity of the vessels involved, or at least the more important of the two, namely the artery.

Three procedures permit this conservation of the arterial current: ligature of the communicating canal, suture of the arterial wall, and endo-aneurismorrhaphy. The superabundance of anastomoses for the return venous flow, renders much less important the conservation of the vein.

However, this ideal operation is rarely performed. In spite of the fact, that for the last few years the number of cases has been quite large, instances of surgical reestablishment of the arterial circulation have been small. Thus, though 91 cases of arterio-venous aneurisms have been presented before the Societé de Chirurgie during this period, the ideal operation was performed only nine times. It would be of great interest therefore to systematically examine the results.

Quadruple ligature and extirpation, often are followed by disturbing sequelæ, for usually the large trunks are involved, and it is these that it is most important to save. Cerebral ischemia and paralysis, in the case of the carotids; extensive or partial gangrene in the case of the vessels of the limbs; disturbance of muscle function in all cases—these are too often the penalties for obliteration of the main arterial current.

In the more favorable cases, at the end of a month or two, everything appears normal after ligature. Cunéo has even stated that arterial pressure had then become normal in the operated limb. This may be true in the state of rest, but when the wounded man works, as soon as the limb is fatigued, he is seized by pains or cramps; he suffers from intermittent functional insufficiency (claudication), just as horses with congenital atresia of the arteries, limp when they are fatigued.

But it is possible in a great number of cases, to reestablish the blood current. Many operations which end in quadruple ligature, should have permitted the reestablishment of the arterial current. The perfection of the technique leaves no doubt about this point of view, and arterial surgery is improving more and more in this direction.

In 1914 and 1915, Bulletins de la Societé de Chirurgie, published 22 cases of arterio-venous aneurisms; there was not one case of arterial suture, but surgeons like Pierre Duval, state that in some of these cases, skillful arterial suture could have been performed.

In 1916, 16 cases of arterio-venous aneurism were published. Some surgeons attempted suture, but none was successful.

In 1917, 40 cases were published. Suture was performed successfully four times (Maudaire, Piollet, Cunéo, 2 cases), that is in 10% of the cases.

In 1918, 13 cases were published, in five of which the arterial circulation was reestablished—a little less than 40%. The technique was also more varied: 2 cases of arterial suture (Chutro, Sencert); 2 ligatures of the communicating canal, (Chutro, Raymond Gregoire); 1 endo-venous suture (Lecène).

I firmly believe that as the anatomy of this lesion, and the ease—comparative, to be sure—of suture becomes lesser known, the number of instances will increase.

There are, however, cases in which quadruple ligature, with or without extirpation, will be the only operation indicated, either because it is the only one justified or the only one practicable. It is the only one justified in certain cases: When, as

* Read before the Societé de Chi rurgie de Paris, March 11, 1919.

in a case of Cunéo's, the aneurism is situated at the end of an amputation stump; when the arterial wall is profoundly altered and presents in addition to an arterio-venous aneurism, an aneurismal dilatation, as in a case I reported in April, 1918, in the *Revue de Cherurgie;* when the wall of the artery, while outwardly normal, is so friable, that it is impossible to pass a suture without tearing the vessel; when the loss of substance has been so great, that suture would obliterate the lumen; in all these cases quadruple ligature with or without extirpation, is the only operation justified, since suture would be useless.

Quadruple ligature, with or without extirpation, is sometimes the only operation practicable. There are several indications for this operation.

First, the seat of the lesion. I do not see how one could treat otherwise than by quadruple ligature, an arterio-venous aneurism of the vertebral artery for example. What can we do for a jugulo-carotid communication situated at the base of the cranium, other than ligature of the carotid and jugular, and tamponade of the lateral sinus?

The stage of the wound, is a factor, to which up to the present, not enough attention has been paid. Experience with a rather large number of cases leads me to think that this is of considerable importance.

When the penetrating agent opens the artery and vein at the same time blood can pass immediately from the artery into the vein; murmur and thrill are present immediately; nevertheless this is not a true arterio-venous aneurism, (with a permanent communication). It is simply a simultaneous wound of artery and vein. A certain length of time is necessary for the permanent establishment of the communication. The preparatory damming process begins very soon. The common sheath of the vessels, infiltrated with exuded blood, reacts by means of a diffuse inflammatory process, which extends to quite a distance beyond the site of the lesion; and meanwhile the endothelium of the two vessels becomes continuous. This process occupies 30 to 40 days.

All surgeons who have operated upon arterio-venous aneurisms at this stage of their development, were struck by the peculiar difficulties, often insurmountable, in exposing and liberating the vessels, embedded in a sclerotic sheath.

To operate within the first 40 days after the injury, is to resign oneself in advance to the quadruple ligature, for suture of the arterio-venous communication is practically impossible at this period. Tuffir himself during a discussion in 1916 (p. 2763), made several statements in this connection, which our late observations found to be absolutely exact.

Dense and extensive adhesions exist in certain cases for an indefinite time after the injury. These alone may prevent any other operation but ligature of the vessels above and below the lesion; they may even render extirpation impossible. There are in addition, cases in which, as a result of suppuration of the wall, there exists a veritable fibrous sheath, enveloping the arterio-venous communication.

I believe that this obstacle will become less and less important, and that with certain exceptions, we will reach the point, where in spite of extensive adhesions, suture of the orifice of communication will be possible. I shall return to this phase of the subject.

Finally, the caliber and importance of the vessels is a consideration which may make quadruple ligature followed by extirpation, the only practical operation. I have in mind aneurisms situated in vessels of the second order. They are relatively rare. It is generally conceded that in these cases it would be useless to attempt a long and difficult operation, when a more simple and rapid procedure will give the same result. The following instance is illustrative:

CASE I. *Arterio-Venous Aneurism of the Anastomotica Magna in the thigh.*

M— (Wilhelm)—— of the —th German Infantry, wounded March 1, 1918, at La Pompelle. Multiple wounds of the lower extremities. Evacuated from H. O. E. at Epernay on March 11th. Arrived on the 16th of March at Hôpital Grand-Lebrun, Bordeaux. Physical examination showed at the level of the Canal of Hunter, an ill-defined tumor, pulsatile, expasile, in which palpation elicited a pronounced thrill, which was transmitted along the femoral vessels up to the middle of the thigh and downward to the level of the opening in the adductor magnus. The diagnosis of arterio-venous aneurism of the femoral was made.

Operation, March 18, 1918. Incision over the femoral, exposed the artery which was dissected for a considerable length. It was found that the tumor was independent of the main artery, and was attached to the anastomotica magna a little below its origin. Dissection of the Tumor. Quadruple Ligature. Extirpation. Cure.

In spite of these important limitations, the re-establishment of the arterial current, is indicated in a large number of cases, and this number will increase as surgeons perfect their technique.

It is important to emphasize that we are discussing only arterio-venous aneurisms of recent origin. At this stage, the lesion is practically an

arterio-venous fistula in most cases, the "phlébartérie" of the older authors. It is probable that the fear and danger of the operation will exist as formerly, until we see fewer and fewer of the old classical forms of cystic aneurisms which represent the advanced stages to which this condition should not be allowed to develop.

Now, in cases of "phlébartérie," it is quite exceptional to find the opening of any considerable size Indeed, one is often surprised at its small dimensions, and after the section has been removed, the surgeon is apt to say to himself that if the adherent surface of the vessels had not been so large, it would have been very easy to suture the defect. In effect, it is on account of the extent of the adhesion of the vessels that the surgeon often makes quadruple ligature his method of choice. This is an error. The zone of adhesions dissects readily, and can be denuded easily with the scalpel.

It is important again to return to this particular point, that the dissection of the lesion is impossible during the stage of its formation. During the five or six weeks in which the double arterial and venous wound is undergoing transformation into a permanent arterio-venous communication, the inflammatory infiltration around the vessels makes them practically inextricable. It is necessary therefore to delay the cure of the arterio-venous aneurism until the permanent anastomosis has formed, namely about 50-60 days after the injury. Mondor and I have noted in addition, that after this date there is often a diminution in the physical signs.

The method to be employed in obliterating the orifice of communication depends entirely upon the ease of the dissection.

1. The dissection is rarely sufficiently easy to permit complete isolation of the vein and of the artery, leaving nothing between them but the canal of communication. Ligature of this communicating structure is the obvious procedure. But it must be remembered that such cases are rare. In 91 cases of arterio-venous aneurisms I have found only one (Chutro, April, 1918) and another which I published with Mondor in *Lyon Chirurgical* (August, 1917). A single ligature may be placed in the communication or more. When a true canal exists, place one suture against the artery, another against the vein, and divide between the ligatures. The other details are uninteresting. This procedure suffices to prevent the flow of arterial blood into the venous current.

2. Generally, the zone of adhesion is so dense that it is difficult to isolate the vessels without opening them at the point of contact.

When the dissection is finished, there are usually two orifices, one in the artery and one in the vein. It is rare to find these openings of large dimension: 5-6 millimeters is the rule. A hole of a centimeter or more is rare. The periphery is sufficiently thick and resistant to allow the passage of a needle and the traction of a suture which, with a buttonhole stitch, closes the defect.

Suture is the method of choice in cases of this type. It can be performed on both arterial and venous orifices. But often the vein is dilated and irregular, and as its conservation is of less importance than that of the artery, the operation is rapidly terminated by the resection of the vein between two ligatures. This method has been followed by Cunéo, Piollet, Maudaire, Sencert, Gregoire.

CASE II. *Arterio-Venous Aneurism of the Axillary Artery. Suture of the Artery.*

G— (Auguste), wounded in the shoulder July 18, 1918, by a bullet, entered the service October 3, 1918, for an arterio-venous aneurism of the axillary artery. The scar of his wound, situated on the external fold of the axillary fossa, was very small, and circular, about like a fifty centime piece.

Nothing abnormal in the region of the arms and the axilla, no swelling, no discoloration, no varices. The cicatrix was not attached to the deeper tissues. There was felt in the axilla a forcible rhythmic thrill, synchronous with the cardiac pulsation. It reached its maximum intensity beneath the pectoralis major, along the vasculo-nervous trunks. It was transmitted with decreasing intensity downward to the bend of the elbow, and upwards along the subclavian.

The left radial pulse has disappeared. The pulse of the brachial could be felt very faintly at the bend of the elbow. On auscultation, a continuous purring murmur is heard, with systalic accentuation. Functional symptoms were vague pains radiating down the arm and forearm, slight weakness of the left upper extremity, and slight coldness of the left hand. Heart sounds normal. Respiratory and urinary organs normal.

Operation, October 16, 1918. Incision over the axillary artery in its lower portion. Dense adhesions were found, rendering the dissection difficult. The veins were much dilated; the axillary vein was of thumb's thickness; the artery was small, hard to see, hidden in cicatricial tissue. A temporary ligature was passed over the axillary above the aneurism, and over the brachial vein below the aneurism.

With difficulty a voluminous sac, situated on the vein at the level of the origin of the profunda was exposed by dissection. This venous sac was isolated between the two ligatures, and delivered; a ligature was passed at its neck at the level of the

arterio-venous communication, which practically amounted to a lateral ligature on the artery. Excision of the sac. Suture of the skin.

At the end of the operation the radial pulse could be felt, which was not present before the operation, nor at the moment the orifice was closed. During the course of the operation, the brachial artery below the communication was remarkably small. During the night, the lateral arterial ligature loosened, which caused a profuse hemorrhage. A tourniquet was applied rapidly. The wound was reopened and a mattress suture was applied to the hole in the artery.

This was then reenforced by a second suture line which took in only the perivascular fibrous tissue. The wound was closed, the suture held, and the pulse could be felt below the level of the suture. The brachial artery at the level of the fistula, presented a slight fusiform dilation. The beat of the brachial artery could be felt down to the elbow. The radial pulse could be felt at the wrist. There remained not a suggestion of a thrill. Perfect cure.

On his discharge from the service the ascillometric measure (Pachon) was the same in the left forearm as in the right: Maximum 15, minimum 10½.

Following the operation the patient had a musculo-spiral paresis, which rapidly disappeared. It is probable that the tourniquet applied at the moment of hemorrhage, provoked by the slipping of the ligature, was the cause of this.

3. There remain now the cases where the adhesion of the vessels is such that it seems impossible to liberate them, and also those in which there is considerable distention of the vein, transformed into a large sac. One is tempted to take the quickest route, to pass ligatures above and below, and to excise the whole sac.

But in these cases the surgeon can apply a suture if it is decided to avoid ligation. It is necessary after applying temporary hemostasis, to deliberately open the sac, find the orifice of the communication, and suture it with an overcast stitch. This endo-venous suture, an example of which Lecène has reported, is according to him very easy. It is likely that as surgeons become more familiar with the condition, the number of cases of quadruple ligation, with or without extirpation will be considerably diminished, and that many arterio-venous aneurisms will be cured with preservation of the arterial current.

The main difficulty in all vascular suture operations is hemorrhage. It is evident that such surgery cannot be performed without temporary hemostasis.

The tourniquet would be a simple means for this purpose if it could be always and completely applied; but this procedure should be condemned. It predisposes to errors; surgeons have placed their sutures outside of the communication, vessels have been left untied, with resultant severe post-operative hemorrhages. It is essential that the blood circulate during the operation; this is the best guide to the lesion and for the establishment of hemostasis.

Temporary hemostasis should be made in the wound itself. The artery should be attended to first. It should be exposed as near as possible to the lesion, an emergency ligature held by an assistant. A serrefine or a rubber tube will stop the flow of blood above the fistula. It is essential to pass the first ligature over the artery and not over the vein. If because it appears easier the ligature is passed first over the vein, the operator will immediately become aware of the increased tension in the vein or in the venous sac, which may even rupture. I have reported such a case.

On the other hand, when the artery is ligated first, the flow of blood into the aneurism is considerably reduced.

There remains one last reason which might deter the surgeon from attempting vascular suture; that is the lack of necessary materials, for very often there are not at hand the needles and silk sterilized in vaseline without which it would seem impossible to perform vascular suture.

I will not say that these materials are useless or superfluous, but I can affirm that their absence is not a good reason for renouncing vascular suture. Twice I had to perform the operation with intestinal suture needles, and nevertheless obtained good results. The first case was that cited above. The other case was one of suture of the femoral on account of wounds. Even though this was not a case of aneurism, it proves that one can suture an artery with ordinary needle and thread without fear of thrombosis or secondary obliteration.

CASE III. *Wound of the Femoral Artery by Knife Cut. Suture of the Arterial Wound.*

B. ....., butcher boy, was admitted to the "Salle Lisfranc" March 24, 1912. On the anterior surface of the thigh, there was a wound 2 cm. in length, situated at the apex of Scarpa's triangle. A knife which he was using to cut beef, had slipped and pierced his thigh. There was abundant hemorrhage which stopped spontaneously.

On admission, there was a large hematoma of the thigh. The interne on duty administered spinal anesthesia, in order to tie the femoral, but exploration of the wound did not indicate its ligation.

During the night of the 24th of March, he had a profuse hemorrhage which was stopped by compression.

On the 27th of March, at 11 A. M., he had an-

other hemorrhage, also arrested by compression. On April 1st at 5 A. M. he had another very profuse hemorrhage, when I was called to see him.

Operation. Incision for ligature at the apex of Scarpa's triangle. Abundant blood infiltration in the vessel sheath. I found a longitudinal wound 1 cm. long on the external surface of the artery, at the level of the bifurcation of the common femoral and on the superficial femoral. A temporary ligature was passed above and below for hemostasis by traction. I was able to perform a complete suture of the wound, but as special needles were not at hand, I used a fine seamstress' needle and silk.

Hemostasis was easily obtained. Cure without complication. Fifteen days afterwards the beat of the femoral was easily palpated in the middle of the thigh.

Summary. The surgery of arterio-venous aneurism should be and is becoming more conservative. The obliteration of the communication is the ideal operation, which is gradually becoming the method of choice. Quadruple ligature and extirpation should be reserved for those cases in which on account of the location, fibrous infiltration, the condition of the vessel wall, and the character of the vessels, no other operation can be performed.

LOCAL ANESTHESIA IN OPERATIONS UPON THE THYROID GLAND.

Joseph L. DeCourcy, M.D.,
Surgeon to Seton Hospital; Assistant Attending Surgeon, Cincinnati General Hospital,
Cincinnati, O.

Much has been written regarding the advisability of using local anesthesia in operations upon the thyroid. Much has been written against its use and the same may be said of general anesthesia. Both have their advocates, and results obtained from the use of both local and general anesthesia in these cases seem equally good in skilled hands. Local anesthesia has been given the preference by such men as Kocher, Socin, Bier, Madelung and Bainbridge; while Mayo, Porter and others favor ether or the combinations.

From January 1, 1918, to July 1, 1919, fifty-five cases of thyroid enlargement presented themselves under my care at the Seton Hospital. Thirty-five were cases of exophthalmic goiter, while twenty consisted of adenomata, colloid and fibrous hypertrophies without systemic symptoms. Five of the thirty-five cases of exophthalmic goiter were refused operations because of their advancement—one dying after remaining in the hospital three weeks. Of the remaining fifty, all were operated upon under local anesthesia, with one death, two hours following the operation. (The death recorded was one of my early cases and was a bad risk.) In the simple goiters the hypertrophied portion alone was removed. Of the thirty exophthalmic cases operated upon in twenty I removed one lobe only, while in the last ten I removed both

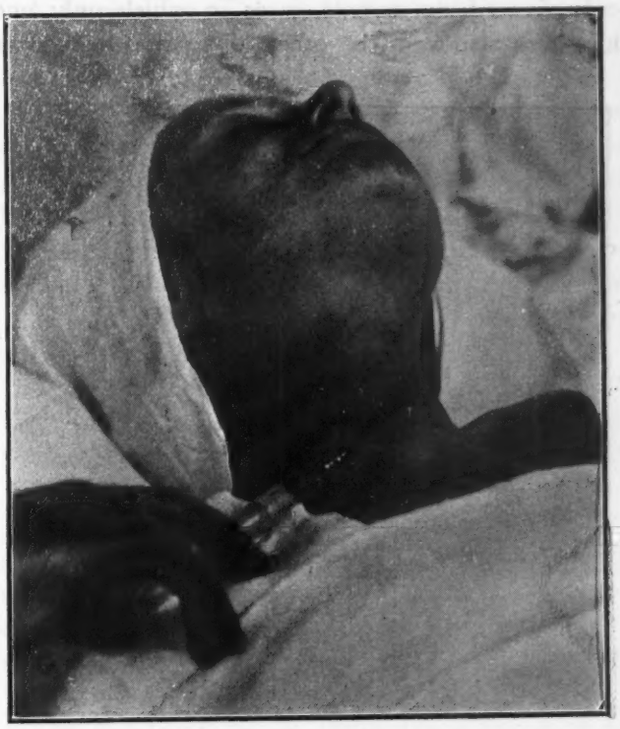

Fig. 1—Subcuticular Injection of Cocaine Solution.

Fig. 2—The Skin Incision.

lobes and isthmus, leaving only a small portion of glandular tissue at each pole.

In five of the twenty cases in which only one lobe was removed, the other lobe was removed at a subsequent operation. The fifteen cases in which one lobe only has been removed show marked improvement, so much so that they have refused further operation upon the other lobe. Of the fifteen cases in which both lobes were removed, ten may be classed as cured (their heart action has returned to normal and increases only slightly upon exertion). Of the five remaining cases the time is too recent since operation to make a satisfactory report.

In the above group of cases, arterial ligation was not used in any case. Of the five cases which were refused operation, two had received a large number of *x*-ray exposures without apparent results. These two patients are now known to be dead. The other three were not considered risks for arterial ligation. Whether the case which died would have been benefited by arterial ligation I am not prepared to say, but I am satisfied that a greater risk can be taken when operating under local

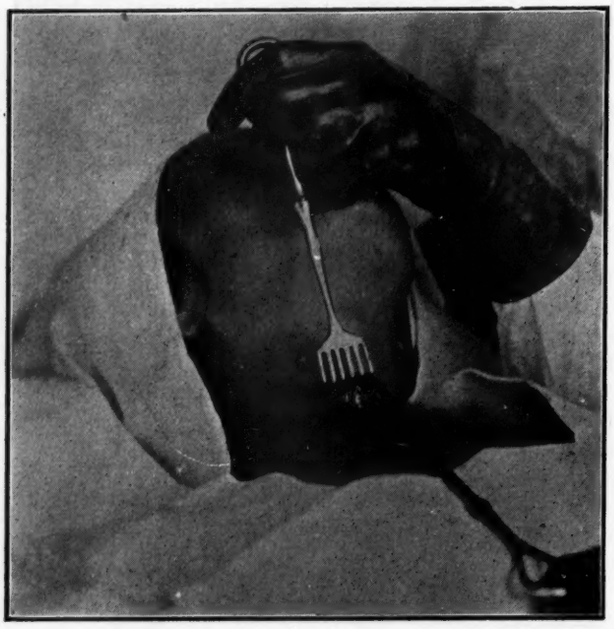

Fig. 3—Retraction of the Skin Flaps.

Fig. 5—Raising the Gland.

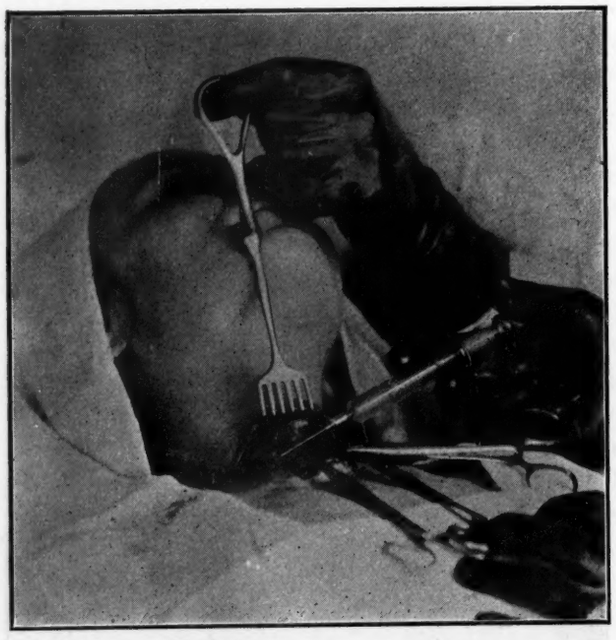

Fig. 4—Infiltration of Muscles Prior to Cutting.

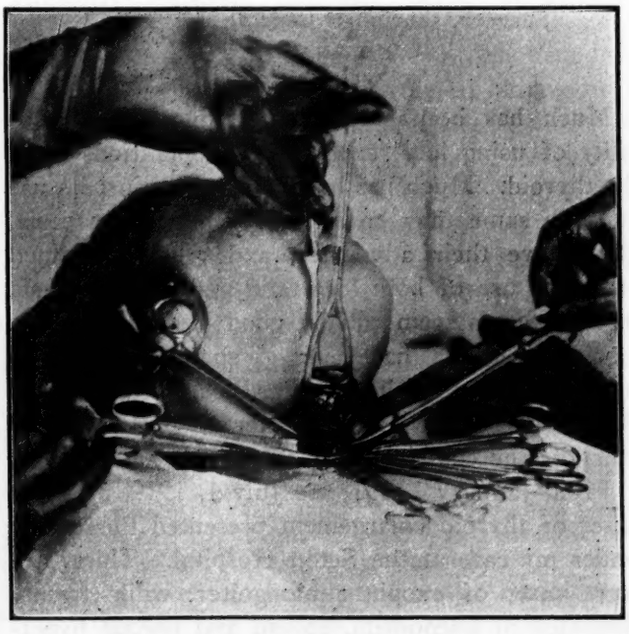

Fig. 6—Excision of Right Lobe of Thyroid. Lower Pole Clamped.

anesthesia than when operating under ether or the combinations.

The advantages accredited to local anesthesia are the following:

1. There is no need for speed—you can readily

Fig. 7—Hot Pad Applied to Control Oozing After Removal of Gland.

see what this means while working in such a complicated area.

2. Hemorrhage is diminished by the epinephrin

Fig. 8—Suture of Deep Structures with Tube Drainage.

("adrenalin") which may be added, thus presenting a clear field for dissection. The epinephrin also serves to lessen the danger of acute thyroidism, supposed to be caused by the colloid freed by the thyroid gland as it is being enucleated.

3. Better protection to the recurrent laryngeal nerve by the possibility of phonation in the conscious patient.

4. Diminution of shock by gentleness of manipulation, which is a requisite to true local anesthesia.

5. Diminution of shock by nerve block.

6. The patient can be of aid to surgeon, i. e. he can hold his breath at critical steps throughout the procedure, thereby controlling the movements of the throat.

7. Avoidance of post-operative vomiting, thereby diminishing the risk of secondary hemorrhage.

8. No extra work thrown upon the kidneys or heart as with general anesthesia.

9. The patient can drink freely both during and immediately following the operation, thereby allowing a free flushing of the excretory system.

10. Maintenance of normal blood-pressure.

11. Elimination of dread and dangers of general anesthesia, a large factor in establishing confidence in the surgeon, thereby assuring nerve-calm and the lack of that fear which every operator of experience dreads, not only in goiter operations, but in other surgical procedures as well.

The disadvantages so frequently cited, such as the patient becoming uncontrollable if anything unforeseen happens, do not hold ground if one is accustomed to using local anesthesia. For a man accustomed to general anesthesia, to occasionally attempt a case with cocaine is but to court failure, because cocaine surgery requires a technic and a patience entirely foreign to general anesthesia.

The treatment preparatory to operation is of the utmost importance and should be insisted upon. Not infrequently a patient will rebel at continuous confinement to the bed for several weeks before operation, but the operator should refuse operation rather than chance an unsuccessful outcome by operating before he is confident that the patient is in fit condition. We insist upon every patient with exophthalmic goiter remaining quietly in bed for at least one week before operation.

Bromides may be prescribed by mouth. The heart is outlined frequently to determine the extent of dilatation or valvular lesions, and the urine is frequently examined. I place great stress upon the preliminary alkalinization of these cases and find that it lessens the toxicity following the operation.

As a general rule thyroidectomy under local anesthesia may be performed with safety if the pulse after a moderate amount of exertion (as in rising from the bed, walking across the room and then returning to bed) does not exceed 120 beats per minute. We have made this rule on the as-

sumption that an operation with careful manipulation causes a reaction which increases the pulse rate from 20 to 30 beats. It can readily be seen that were we to operate with a pulse of 140 to 150 that the reaction following would raise the pulse to 170 or 180 and would in all probability cause death, whereas with the pulse at 120 or less (other factors being equal) the reaction would raise the pulse to 140 and it would then stay within the zone of safety. (We use these figures merely as a control to the toxicity of the case.)

If the rapidity of the heart action does not subside within a reasonable period arterial ligation may then be resorted to. Arterial ligation in itself, however, is not without danger. *X*-rays, radium and hot water injections have their advocates.

My conclusions are as follows:

1. I advise early operation whenever possible—In skilled hands there is no more danger in removing a simple adenomatous or benign (not exophthalmic) goiter than there is in interval appendicectomy; and benign goiter should be considered as potentially dangerous as a simple appendicitis or a hernia.

2. Preliminary observation and treatment in all cases of exophthalmic goiter with intensive study of the heart, kidneys and blood, are important.

3. If case does not respond to internal medication and rest, arterial ligation should be performed.

4. As a general rule I do not perform thyroidectomy when the pulse after a moderate amount of exertion exceeds 120 per minute.

5. I believe that a greater risk can be taken when local anesthesia is used than is possible under general narcosis, and that arterial ligation will be less often indicated.

6. Removal of both lobes and isthmus gives the best results in exophthalmic goiter and causes less reaction following operation.

7. Thyroidectomies can be done painlessly and thoroughly under local infiltration.

HOSPITAL RESEARCH.

One of the weaknesses in the practice of surgery is that men tend to become stationary, and call it standardizing their work. A surgical research department in a hospital would save the surgeons from becoming fossilized. The chief value of research work consists not in the number of new facts discovered, but in keeping all workers still students. The student type of mind, always groping for new light as it does, is a *sine qua non* if a surgeon is going to give his patients their due.—JASPER HALPENNY in *The Canadian Medical Association Journal.*

MODERN TECHNIQUE IN HERNIA OPERATIONS.

JOSEPH H. FOBES, M.D., F.A.C.S.,
NEW YORK CITY.

Recurrences after hernioplasty, claimed by Moschcowitz[1] to reach in all types the large proportion of 7% or more, render the discussion of operative technique in order. The statistics of some operators are not always reliable for they represent selected cases. The results of operations on children and adolescents are much better than in the aged or in those of middle life. Recurrence, according to Moschcowitz[1], is due to a poor type of operation or to poor execution of a well selected operation.

In general, the most satisfactory theory of the etiology of abdominal hernia is a disproportion of pressure in favor of intra-abdominal as against extra-abdominal. The weakened support of points in the abdominal wall, as exemplified in the so-called rings, especially in the lower portion where the force of gravity aids, give way and hernia results. The obvious method of repair is first to remove the source of intra-abdominal extra pressure, such as fluid, fat, gas, tumor, etc., by appropriate treatment, operative or otherwise, and to buttress the weak points by placing fascia supports over them as near the exits as possible, at the same time so suturing peritoneum as to render it smooth over the former funnel-shaped openings. Unfortunately, in some instances, as at the internal inguinal and femoral rings, it is impossible to entirely accomplish this without removing or injuring important structures, such as the cord, femoral vessels, etc. It is important, however, to endeavor to reach as near this ideal as may be possible. This is the excuse for the presentation of this topic.

Inguinal hernia is the most common form of rupture. The operation which has been successful in my hands is a combination of several methods with one or two original points. A curvilinear incision is made starting from a point just above and to the mesial side of the external ring and ending at a point external to and just above the internal ring. This skin incision brings the skin suture line above that area in the crease of the groin which is so hard to sterilize and therefore so prone to infection. It also places the skin suture line at a different level from the deeper line of suture. The skin flap is laid back and an incision is made through the external oblique aponeurosis about on a level with the foramen of exit of the hypogastric branch of the iliohypogastric nerve. Formerly I

made a curvilinear incision of the fascia also, but I have discontinued this because it incises the fibers of the external oblique instead of splitting between them. The lower end of this incision is just above the internal pillar of the external ring. The upper end lies just above the internal ring. This flap is then pulled down, avoiding injury to the hypogastric branch of the iliohypogastric nerve and the shelving edge of Poupart's ligament is demonstrated. The structures of the inguinal canal are then separated. The cord is lifted and the sac, which usually lies posterior and superior, is dissected back to its origin. Throughout the operation, all bloodvessels are carefully clamped and tied, as this region is productive of hemorrhage when this detail is not closely observed.

Before opening the sac, it must be plainly demonstrated that it is not composed of bladder nor of the type called sliding hernia. Bladder will be recognized by a peculiar fatty formation which is more or less firmly attached toward the median line. Sliding hernia will be recognized by the presence of large intestine which is firmly adherent to what one might imagine was the posterior layer of an ordinary sac. If bladder is present, it is carefully pushed aside. If a sliding hernia is present, a new mesentary is created for the intestine, after which it will be found that it is reduced with comparative ease. The sac is opened and the contents returned to the abdomen. If omentum is present in such large amounts that it can not be reduced, the nonreducible portion is ligated with interlocking chain ligatures and removed. Frequently, on the right side, it will be possible to remove the appendix. If upon opening the sac the intestine is found to be strangulated, a few moments are spent with hot applications watching for return of circulation and peristalsis before performing resection, if necessary. The sac is then transfixed, taking care that the intestine is out of the way, and a double threaded suture is passed up under the transversalis fascia, through it and through the external oblique fascia as near the anterior spine of the ilium as possible. The free ends of the transfixion ligature are then threaded on a similar needle and passed up in the same manner to be tied underneath the skin. This obliterates the dimple formerly noted at the internal ring and, as demonstrated during an intra-abdominal operation causes the intestine to slide toward the perineum or outward into the iliac fossa.

The next step is the repair or buttress of the weak points in the inguinal region. Lifting and carefully dropping the ilio-inguinal nerve, the conjoined tendon, as in the Bassini operation, is joined by mattress sutures to the shelving edge of Poupart's ligament. In doing this there are two sutures, the improper placing of which is responsible for the majority of recurrences. One is a suture placed just external to the internal ring which prevents splitting outward; and the other is placed at the lower angle of the incision including the conjoined tendon and Gimbernat's ligament. The cord still being lifted, the essential difference in the author's operation may be noted. The superior cut edge of the external oblique is brought down underneath the cord and is carefully fixed to that portion of the aponeurosis of the external oblique just above the shelving edge of Poupart's ligament. The inferior edge, the cord having been dropped, is now brought over the cord and sutured to the smooth surface of the external oblique aponeurosis superiorly. The skin is then closed by Michel clamps or a subcuticular suture and court plaster method.

This operation provides two aponeurotic layers underneath and one above the cord and is especially of use in the direct type of inguinal hernia where the conjoined tendon is poor in quality and widely separated. I have operated upon over fifty cases with this method, lasting over a period of years. In no instance in the brief series and in hospital cases which could be followed, has there been any recurrence. In one case where the ordinary Bassini operation was performed on one side and my method upon the other, it was interesting to note a recurrence after the Bassini operation and a perfect result on the other side.

In our Metropolitan Hospital, because of cardionephritis, tuberculosis and other conditions, it frequently becomes necessary to operate on these cases under local anesthesia. A skin infiltration of 1% novocain solution with one drop of adrenalin, one-to-one-thousand, to every sixty drops of novocain solution, with a wait of fifteen minutes by the watch, is the initial procedure. This is followed by a thorough infiltration with one-half of 1% novocain solution and there is little pain experienced thereafter if the neck of the sac is infiltrated before manipulation. We have found it possible to remove the appendix painlessly in some of these cases.

The Bassini[2] operation which dates back to 1891 has the following disadvantages: First, the sac is not dislocated; second, there is no extra layer of fascia below the cord. The Halsted method relies upon the cremaster muscle which has no healing power and the cord is placed under the

skin where it can easily suffer trauma. The Halsted method of utilizing the fascia and fibers of the rectus is wrong, for the pull is vertical and tends to separate constantly. Ferguson's method is faulty because there is no transplantation of the cord. The Andrews method grasps the conjoined tendon and the superior border of the external oblique incision and joins them at one bite to Poupart's ligament, making a bulky mass. This method also fails to dislocate the cord. The Kocher method is an unsurgical procedure and has been discarded. The advantages claimed for the author's method are as follows: First, a more natural, firm aponeurotic protection anteriorly and posteriorly to the cord and to the abdominal contents; second, a quicker return to health and earning power on the part of the patient (out of bed in twelve days, in fourteen days out of hospital); third, the absence of scrotal edema due to constriction of the cord at the external ring; and fourth, a better result at the end of a period of months than the old Bassini operation or any of its more modern modifications.

The next most common form of hernia is the femoral. The diagnosis is not difficult if one remembers that the femoral sac comes down underneath Poupart's ligament to the mesial side of the femoral vessels and out on the upper part of the thigh through the saphenous opening. All femoral hernial sacs lead below Poupart's ligament. The operative treatment may be summarized as follows: First, ligation and extirpation of the sac. This is usually ineffectual except in children. Second, incision in the femoral region. This does not displace the sac and does not place a firm covering over the opening of the hole in the fascia transversalis (Bassini, DeGarmo, Berger, Coley, etc.) Third, high approximation of Poupart's ligament to the pubic bone by tacks, etc. The objection to this is the presence of a foreign body and it does not place obstruction to the ring within. Fourth, the Moschcowitz method which, in my opinion, is the operation of choice. This consists of an incision above Poupart's ligament, parallel with the ligament, division of the aponeurosis of the external oblique, lifting the cord as in inguinal hernioplasty, and an incision of the transversalis fascia on the mesial (inner) side of the femoral vessels, retracting these. Cut from without in, to avoid an abnormal obturator artery. Demonstrate the sac of the hernia and bring it into the wound. If the intestine is strangulated, nick the sac at the neck and remove the fluid. Resect the intestine, if necessary. Close the sac and proceed as in inguinal hernia. The treatment is now the same as for direct inguinal hernia,—Bassini, Andrews, or my modification, taking in both Cooper's and Gimbernat's ligaments.

The third and last common form of hernia is umbilical. At birth the ring through the funicular portion of the transversalis fascia admits four structures—superiorly, the umbilical vein; inferiorly, two hypogastric arteries and the urachus. After birth, when the cord is tied, the hypogastrics obliterate by clot. Before birth the urachus becomes a fibrous cord. Both structures run to the bladder base. The umbilical vein takes longer to obliterate and finally fuses with the round ligament of the liver. This makes a three-point suspension of the umbilicus. Soon after birth, the transversalis fascia becomes much strengthened by connective tissue and is called Richet's fascia. (Moschcowitz[1]). Following are the types of umbilical hernia:

I. Congenital—formed before Richet's fascia is formed and at the site of the umbilical vein opening.

II. Infantile—due to imperfect Richet's fascia and occurring at the umbilical vein opening.

III. Adult—presupposes a weakness in ligaments. It occurs at the umbilical vein opening, and is due to intra-abdominal pressure, childbirth, tumors, etc. The signs and symptoms are the usual ones of hernia. The treatment is a radical operation by the Mayo method. It consists of an elliptical incision, excising skin and fat on the site of the sac which is composed of skin, Richet's fascia and peritoneum, opening this and reducing or amputating the contents, with or without anastomosis. The peritoneum should then be closed transversely, and aponeurosis overlapped from above downward, thus restoring the three point suspension. This operation is uniformly successful.

I trust that this demonstration shows the necessity for still more careful work in the treatment of hernia. The fact that there is still over 7% of recurrence shows that we have not arrived at an ideal method as yet, but the work of Moschcowitz along these lines has laid a firm foundation for further study and I feel sure that the coming years will see a reduction in the number of recurrences in adult hernias which will equal that found in children, namely, nine-tenths of 1%.

1 WEST SIXTY-EIGHTH STREET.

REFERENCES.

1. Moschcowitz—Operative Therapeusis (Johnson).
2. Bassini—Arch. f. Clin. Chir. XL. 429.

MUSTARD GAS BURNS.*

W. P. CARR, M.D.,
WASHINGTON, D. C.

Last spring and summer I treated four patients burned with mustard gas. There are at least seven varieties of gas included under this general term and I am unable to say which variety produced the lesion in my cases.

The phenomena presented by these burns were so unusual and interesting to me that I hope a brief report of them will be of interest. Much of the unusual features were present in each case and were as follows:

1. A long interval between exposure and the appearance of symptoms. This interval varied from sixteen to thirty-six hours, and reminded me in this respect of poison ivy. No disagreeable sensation was felt at the time of exposure, nor until after the lapse of many hours, when pricking and stinging sensations commenced in the skin. This was followed a few hours later by the appearance of vesicles which rapidly coalesced into large blebs. One patient did not even know for thirty-six hours that he had been in contact with the gas.

2. There is an acute stage during which the poison absorbed into the tissues continues its destructive action. This acute stage may last a few days, or for the astonishing period of two or three months, and may be interrupted by quiescent intervals when the wound seems to be healing.

In this respect also the gas acts in a manner similar to the toxin of poison ivy and some similar substances, which cause recurrences after apparent healing. This active destruction may go on in part of a burn while other parts of it are rapidly healing.

In one of my cases, although part of the wound healed with remarkable rapidity, even where the whole thickness of the skin was destroyed, successive layers of slough continued to form and shed off in the deeper portion for about two and a half months; until in places the destructive action had eaten nearly an inch into the underlying muscles over an area of about six by ten inches. Numerous cultures were made during this period but no organisms were found except, on two occasions, the hay bacillus.

I am inclined to believe that the poison killed bacteria as well as the patient's tissues.

The wound would look healthy for a week and then become covered with dead tissue and bathed in pus which always proved sterile or practically so, and when this slough loosened and came off a clean, healthy looking surface was left again. This recurred repeatedly, sometimes over part of the raw surface, sometimes over the whole of it until I almost despaired of its ever healing. Cauterizing the surface with silver nitrate aggravated the condition, and wet dressings of Dakin's fluid and other mild antiseptics did no good except to help dissolve the sloughs.

3. Individual susceptibility varies greatly, as it does to poison ivy and its congeners. Three of my patients were experimental chemists working on war gas in the same governmental laboratory. They told me that sixty workers in this laboratory had submitted to small experimental burns in testing gases, or protective skin coverings. There was, they said, great variation in susceptibility and a few were practically immune.

The duration of the acute stage and consequent severity of a burn depends largely, therefore, upon individual peculiarity as well as upon the length of exposure and degree of concentration of the gas.

It is difficult, or impossible, to tell how severe a given burn will be until the acute stage is over, and difficult to say when it is really over, until a week or ten days has elapsed after the wound has appeared to be healing; for a relapse may occur later.

4. The intensity of inflammation caused by the gas is evidenced by the great infiltration of the skin with yellow lymph, stained with broken down hemoglobin and coagulated into a solid mass resembling hard fat. These blebs invariably destroy the whole thickness of the skin and may go much deeper and tissue destruction may continue after their separation. Fluid exudates from them, or from under them, if allowed to remain in contact with the sound skin, may cause a serious lesion. In appearance and to the touch, the blebs resemble lipomata. Some of the beautiful wax models in the Army Medical Museum, made by Captain James F. Wallace, illustrate this in a striking manner.

5. During the acute stage there is burning pain, severe at times, even when the wound is covered with a bland dressing and at rest. But, when exposed, the lightest touch with a film of cotton, a drop of water, or even a breath of air, will cause severe pain. When the acute stage is past the raw surface is not sensitive. The extreme penetrability of the gas was well illustrated by Case II (appended). This young man was tightening a connection on a pipe leading from a tank of gas.

*Read before the Southern Surgical Association, December, 1918.

He did not know that any of it had gotten on his skin. Thirty-six hours later, he began to burn and tingle not only on his left hand which had held the pipe, but all over his chest, abdomen and legs, and on the upper surface of his feet, although he had on high shoes and stockings when exposed. Fortunately all the burns were only of the first degree and healed in ten days except those on his left hand.

The burn on his hand, however, continued active for nearly three weeks and destroyed the whole skin on the dorsum of three fingers and between the fingers. Healing may progress rapidily in the superficial part of a burn at the same time that active destruction is going on in a deeper part.

Treatment. From my limited experience I should say that all blebs should be cut away with scissors and the sound skin and superficial part of the burn protected with a coat of ambrine or paraffin, after a thorough cleansing with sterile water and drying.

I found in my cases that a dressing of ambrine gave marked relief and that healing was more rapid under it than under any other dressing used. Wet one and one-quarter per cent. phenol dressing and the Carrel-Dakin dressing were used at times and the former apparently relieved pain, while the latter had a marked effect in dissolving stubborn sloughs and lessening discharge.

CASE I. R. M., civilian experimental chemist, 24 years old, March 9, 1918, while doing experimental work for the government at the Catholic University, D. C., accidentally broke a container and scattered some of the contents of liquefied gas over himself. He immediately washed the exposed surfaces but did not remove his clothing until two hours later at bedtime. He did not think enough gas had got on his clothing to do any harm.

Nothing was noticed until sixteen hours later when itching, burning and pricking sensations were felt over the chest, abdomen and right leg. The next day vesicles appeared on the right thigh and wrist. They rapidly coalesced and formed large blebs filled with solid coagulated yellow serum.

He was sent to the Emergency Hospital and I saw him there at the request of Dr. George Ruffin and took charge of the case the eleventh day after the accident. He had been treated from the onset of symptoms to this time with compresses wet in sodium bicarbonate solution and twenty-five per cent. magnesium sulphate solution. When I saw him he had a deep burn on the flexor surface of the right wrist about one by two inches, large pigmented areas on the chest and abdomen where very superficial burns had been and a very large burn on the right thigh extending from the middle of the patella to two inches above Poupart's ligament, over the scrotum and head of the penis and more than half way round the thigh on the anterior aspect. The edges of the wound were superficial but gradually deepened toward the center until the whole thickness of the skin was destroyed at an average distance of an inch and a half from the edge. Sloughs had come off this part of the burn, leaving a red, granulating clean surface, but an area in the center about six by ten inches was covered by large blebs that looked and felt like fatty tumors after removal. These solidified blebs were still tightly attached and went through the skin and into the underlying muscle. They were trimmed off with scissors and the whole burn dressed with ambrine; ambrine dressings were applied every day or every other day for a month, and with occasional interruptions of a week when the Carrel-Dakin method was tried, these ambrine dressings were continued for five months.

The superficial portion healed rapidly and even portions where apparently the whole thickness of the skin was destroyed healed in a month without apparent scar. But a large area in the center originally covered by the blebs continued to form and shed sloughs for two and a half months, at intervals of about a week. This part of the wound consequently grew deeper and very irregular in depth. Parts of it ate into the muscles for nearly an inch. The discharge was free during the acute stage which lasted about three months and consisted mainly of coagulated lymph and serum. It was examined at intervals of a week but no organisms were found except on two occasions when the discharge became green and hay bacilli were found.

The patient on these occasions noticed the odor of hay, or dried apples as he called it. On several occasions epithelium which had accumulated around the edges was scraped off and scattered over the surface, where it began to form islands, but these islands came off with the sloughs.

Finally, when I was almost in despair, the sloughing ceased, granulation became rapid and numerous islands of epithelium became apparent and grew in a very satisfactory manner. These islands fused and cut up the large raw surface into several small areas. Healing was rapid and by June 10th was nearly complete. I left the city at that time for three weeks, expecting to find the cure complete on my return. But when I got back I found the raw surface larger than when I left and infected with bacillus pyocyaneus. A week's treatment with one-quarter per cent. phenol solution got it into healthy condition again. Ambrine dressings were resumed and by August 16th healing was complete. There was almost no perceptible scar, but much brown pigmentation. I attribute the lack of scar to the ambrine treatment. I have used it or paraffin on many bad burns and have been highly gratified to find little or no scar perceptible even where the whole skin had been destroyed. I have seen no difference in the result whether ambrine or parawax was used.

CASE II. L. G. W., also an experimental chemist working for the government. He was burned in Cincinnati, about May 9, 1918, and treated in hospital there until May 20th when he came to Wash-

ington and I saw him first May 21st. He said he was tightening a connection on a pipe leading from a tank of gas, and did not know he got any of it on him until thirty-six hours later when he began to tingle and have a pricking sensation of the skin. In a few hours more vesicles appeared on his left hand and light burns of the first degree with a great amount of dark brown pigmentation appeared on his chest, abdomen, legs and even on the dorsum of each foot, although he was wearing high shoes. He could not say whether the gas penetrated the leather or filtered through the shoe tops.

When I saw him ten days after the first symptoms he had what I took to be a burn of the first degree over his whole left hand except the palmar surface. The yellow blebs appeared, however, a few days later and the whole skin was destroyed in the sulci between his fingers and over a large part of the dorsum of his hand and fingers.

I treated him for three weeks with ambrine. The sloughs came away and healing was well under way at that time, when he left the city for the west.

CASE III. H. S., Lieutenant in the Army and experimental chemist. Had a burn about the size of a half dollar on forearm, made as a control in testing a protective dressing for the skin.

I saw it thirty-six hours after exposure. Vesicles had appeared. Next day two yellow blebs about half inch in diameter developed and left deep but small ulcers that took three weeks to heal.

CASE IV. J. M., civilian chemist. Case almost identical with Case III.

AN ICE-PICK IN THE SPINE.

Case Report from the Clinic of

ELMER E. FRANCIS, M.D., F.A.C.S.,
Professor of Clinical Surgery and Applied Surgical Anatomy, University of Tennessee,
MEMPHIS, TENN.

A female, thirty-one years of age, well developed and well nourished, suffering from a partial paralysis of the left leg, was admitted to the hospital with a punctured wound in the back. This patient had been in the hospital for more than a week; the interne thinking her case was a minor wound, had failed to report her to me until yesterday. The family and past history of the patient is of no especial importance, so far as the accident is concerned. The hospital records show she was here two years ago on the medical service and had a four plus Wassermann reaction. She remained only a few days and no diagnosis was recorded.

The history of the present accident is that at 4 A. M., January 6, 1919, she was struck in the back with an ice-pick. On examination a small punctured wound was found a half inch to the left of the spinous processes on a line with the inferior angle of the scapula. She was immediately partially paralyzed in the left leg, with pain radiating down the back of the left thigh. She had been up and around the ward dragging the left leg, until my attention was called to her yesterday. An *x*-ray picture was ordered. It shows very plainly about four inches of an ice-pick in the spinal column. The wound has about healed and shows a very slight infection which is superficial. Aside from the injury to the spine, the interesting points

in this case are the size of the foreign body and its location, and the small amount of infection.

The patient being anesthetized, an incision is made over the original wound which readily exposes the end of the foreign body, firmly imbedded in the bone. It requires considerable force to dislodge it. An antiseptic dressing completes the operation.

Subsequent Note: The patient was up in the ward in two or three days, and left the hospital in ten days, showing slight paralysis of the left leg. After three months she reported perfectly well.

NEW YORK AND NEW ENGLAND ASSOCIATION OF RAILWAY SURGEONS.

The twenty-eighth annual session of the New York and New England Association of Railway Surgeons will be held at the Hotel McAlpin, New York City, on Monday, October 20th, 1919. A very interesting and attractive program has been arranged. A symposium on "The Modern Treatment of Infected Wounds" will be presented by leading surgeons. Railway surgeons, attorneys and officials, and all members of the medical profession are invited to attend.

American Journal of Surgery
PUBLISHED BY THE
SURGERY PUBLISHING CO.
J. MacDONALD, Jr., M.D., President and Treasurer

15 East 26th St., New York, U. S. A.
to whom all communications intended for the Editor, original articles, books for review, exchanges, business letters and subscriptions should be addressed.

SUBSCRIPTION PRICE, TWO DOLLARS.
FOREIGN, TWELVE SHILLINGS.

Original Articles and Clinical Reports are solicited for publication with the understanding that they are contributed exclusively for this journal.

It is of advantage to submit typewritten manuscript; it avoids errors.

CHANGE OF ADDRESS. Subscribers changing their address *should immediately notify us of their present and past locations. We cannot hold ourselves responsible for non-receipt of the Journal in such cases unless we are thus notified.*

ILLUSTRATIONS. Half-tones, line etchings and other illustrations will be furnished by the publishers when photographs or drawings are supplied by the author.

☞ SPECIAL NOTICE TO SUBSCRIBERS ☜

The "American Journal of Surgery" is never sent to any subscriber except upon a definite written order. Present and prospective readers please note this.

WALTER M. BRICKNER, M.D., F.A.C.S., Editor

NEW YORK, OCTOBER, 1919

THE STETHOSCOPE OF LAENNEC.

While nations are grappling with the problems of tuberculosis, it is not out of place to pause in this year 1919 to consider one of the epochal discoveries which may be said to have laid the foundation of the modern study of this subject. Numerous surgical conditions which have as their etiological factor the bacillus tuberculosis, in a large proportion of cases are related to the development of pulmonary infection. The causative organism was discovered by Koch in the latter part of the nineteenth century, although the disease itself has been known from immemorial times. The great impetus given to the study of tuberculosis is intimately associated with the disease itself. A tuberculous son of a tuberculous mother, both of whom succumbed to the disease, were responsible directly and indirectly for the invention of an instrument most powerful as an agent in the campaigns to lower the mortality of the white plague. Next to the actual discovery of the bacillus of tuberculosis, the greatest event in connection with the historical development of our efforts to control its spread was the invention of the stethoscope in 1819 by Réné Theophile Hyacinthe Laennec. The first cylinder of paper which he employed gave birth to an instrument of precision and the art of auscultation. The publication of his paper *Traité de l'Auscultation Médiate* was the real beginning of our modern knowledge of diseases of the thorax and the methods of investigating them by mediate examination.

To Laennec humanity is indebted for his thorough correlation of the signs elicited through auscultation, and the corresponding pathological conditions giving rise to the auscultated sounds. To most persons, he is undoubtedly better known as the describer of the chronic diffuse interstitial hepatitis frequently termed "Laennec's cirrhosis." Such fame, however, while paying tribute to his skill as a pathologist and clinician, fails to give him the meed of honor which he deserves as a leader in the differentiation of conditions within the thorax. The descriptive terms now so familiar to those studying pulmonary conditions were created by him, and when we speak of râles, pectoriloquy, egophony, we employ terms given to the world by Laennec.

The stethoscope invented one hundred years ago, was the main factor in unraveling many of the mysteries of diseases of the thorax. While the accomplishments of Auenbrugger along the lines of percussion had advanced pulmonary diagnostics, the basis of differentiation of numerous diseases awaited the application of Laennec's ear to his simple stethoscope. He it was who decribed and differentiated bronchiectasis, pneumothorax, hemorrhagic pleurisy, pulmonary emphysema, and pulmonary gangrene. In many ways it may be said that the Breton internist was the main figure among the numerous historic clinicians, who established upon a firm basis the diagnostic criteria of cardiac and pulmonary diseases.

Today the stethoscope is an essential instrument of modern medicine. A knowledge of its use is requisite for every one who honestly seeks to familiarize himself with the normal and abnormal sounds generated within the human body. It is an essential to medical science and art. The part it has played in the history of pulmonary diseases is second to none. The various facts ascertainable through its use have gone far to enable the early diagnosis of tuberculosis. It has been of the highest service in enabling this dread disease to be discovered in its incipient stage. The probable decrease in mortality from tuberculosis is largely attributable to the detection of the disease in its early stage. The decline in the number of surgical complications and sequelae is similarly closely related to more expert diagnostication through the use of the stethoscope.

The surgeon with his exploring needle or scalpel

possibly lays less stress upon the employment of the stethoscope than is merited by the value of the facts which it suggests or reveals. Possibly greater attention is given to percussion than to auscultation because the fingers are always with the surgeon, while the stethoscope is more likely to be in the office. Nevertheless, immediate auscultation is of primary importance in the differentiation of intrathoracic diseases, when the stethoscope is not at hand.

The medical historian or the student of modern preventive medicine, called upon to indicate the effective devices for diagnosis sufficiently practical to be of immense service in lessening the fatality of diseases, would unhesitatingly class the invention of the stethoscope in 1819 as of paramount importance, and little less valuable than the discoveries of Koch, Pasteur, and Lister. From the surgical point of view the investigations of the last named would stand forth as the crowning glories of a century, because of their revolutionary effect upon surgical practice. From the viewpoint of humanity as a whole, however, it is probably not incorrect to state that the general effects of Laennec's invention have been productive of greater benefits than the results of the valuable discoveries of any one of the others mentioned, though probably not so great as the advance in public welfare resultant from their combined activities.

It is not unfitting that the centenary of the stethoscope be duly honored, and that our medical brotherhood should give a grateful thought to the memory of him who contributed it to the world.—I. S. W.

Surgical Sociology

Ira S. Wile, M.D., Department Editor.

RESPONSIBILITY FOR ABDOMINAL HERNIAE.

We have vigorously protested in these columns (THE JOURNAL, June, November, 1915) against the view—universal among the laity and still far too common in the profession—that the familiar abdominal herniae (inguinal, femoral, umbilical) arise from "accidents," such as "strains," falls or ordinary blows; and we have called attention to the unfair burden that such a view (for which the unfortunate term "rupture" is perhaps largely responsible) puts upon accident insurance companies and upon all those who bear the costs of "Workmen's Compensation Acts."

It is not necessary to repeat the arguments that condemn the unscientific and ignorant aspect of hernias that still largely prevails among insurance companies and in the courts; nor need we further quote other writers in support of our contention. We believe that most thinking surgeons will admit that the abdominal herniae, whether found congenitally or developing late in life, arise from a preformed anatomical defect; that a straining effort or a fall can operate, at most, only to fill or to distend an already existent sac or to increase an unnoticed protrusion ("direct" inguinal hernia); that only the rare cases of protrusion through a severely crushed or perforated abdominal wall can properly be styled traumatic or accidental herniae.

It seems curious that what is so clear to those who are most familiar with the subject should have failed of general recognition, that in our courts of law and among insurance companies "ruptures" still pass as accidents. It is, however, encouraging to observe from time to time that the truth is slowly gaining ground and that even some of our lawmakers are getting an inkling of the truth that an abdominal hernia is not an accident but a "disease."

Industry should be freed from the responsibility, under Workmen's Compensation Acts, for herniae developing during employment. Whether or not industrial organizations should assume the cure of such herniae and thus restore the individuals to full working capacity, is an economic problem that has a wholly different basis. In this connection, and from the standpoint of "compensation" responsibility, it may be interesting to quote here some passages from an artcle on "Hernia in Industry," by Charles A. Lauffer, medical director of the relief department of the Westinghouse Electric and Mfg. Co., which appeared in *The Journal of Industrial Hygiene*, August, 1919:

> The acquired hernial sac arises slowly, because the peritoneum is a tough, resistant membrane, and can not be pushed out to form a sac by any single impulse. This is readily demonstrated on the cadaver; no finger is strong enough to push out the peritoneum suddenly at the internal ring.
>
> * * * * * *
>
> Just as a house is a house before it becomes tenanted, even so an empty hernial sac constitutes a latent hernia, before the said preformed hernial sac acquires contents.
>
> * * * * * *
>
> An acquired hernia is a disease. The acquired hernia is popularly confounded with true traumatic hernia to so appalling an extent that more cases of alleged traumatic hernia have been awarded compensation in Pennsylvania (exceeding 4000) than there have occurred cases of real traumatic hernia in the western hemisphere since Columbus discovered America [!] Other commonwealths have

been as notorious in awarding compensation for acquired hernias, pathological in type, which are in no sense true traumatic hernias.

* * * * * *

For the truly traumatic hernia, the employing industry is undoubtedly responsible under the Workman's Compensation Act, but less than one hernia in a thousand is of this type, hence, the 999 constitute a burden imposed by law on industry.

* * * * * *

Hernia interferes with production. The employee with hernia can not put his native energy into the work; in lifting, pulling, and pushing, he does not do his share, but is disposed to shirk; he always wants to be placed on some easy job, where he will not have to work hard. The patient with hernia has difficulty forgetting himself in his work.

* * * * * *

Where a reasonable presumption exists that the employee's hernia has arisen in the course of his employment, our company accepts the patient's viewpoint and repairs the hernia without expense to the employee.

* * * * * *

Operating practically all hernias that arise does not constitute an acceptance of liability for the payment of compensation benefits.

* * * * * *

We are convinced, moreover, that performing herniotomies for pathological hernias should be regarded as a gratuity on the part of the industries, calculated to restore faithful employees to industry and, at the same time, as a patriotic duty by which industrial workers are restored to their greatest efficiency. W. M. B.

Progress in Surgery

A Résumé of Recent Literature.

Infective Hemorrhages from War Wounds. HAROLD NEUHOF and FORDYCE B. ST. JOHN, New York. *Surgery, Gynecology and Obstetrics,* August, 1919.

Neuhof and St. John present 45 cases of so-called secondary hemorrhage from war wounds. They prefer the term infective hemorrhage rather than secondary hemorrhage, because in practically all cases of war wounds showing late hemorrhage, the infectious process is present, and can often be pathologically shown invading the arterial wall. In all specimens of arteries resected for infective hemorrhage, the rupture was an oval defect or elliptical defect, lying in the long axis of the vessel. The margin of the defect was often smooth and rounded off, shaggy in other cases. Thrombi in the lumen were occasionally observed. The authors present a detailed study of the pathological condition of the arteries involved, showing the invasion of the infective agents. Many types of bacteria were found, but they could rarely be demonstrated in the muscularis except at the site of rupture. There is often associated a fatal vein infection, or suppurative thrombosis of the adjacent veins. The treatment is mainly prophylactic. Conservative measures, such as packing are dangerous even in the slighter cases. Amputation is indicated for most cases of hemorrhage from the popliteal or posterior tibial artery. The main artery should be tied off in a non-infective area. Where amputation is not indicated, it is better to resect the artery through an incision above the source of hemorrhage, preferably in a non-infected area. The authors call this the "surgical approach." The veins, unless they are important trunks, should be resected at the same time.

The Treatment of Metastatic Carcinoma of the Spine by Deep Roentgenotherapy. GEORGE E. PFAHLER. *Surgery, Gynecology and Obstetrics,* September, 1919.

The author presents four cases of metastatic carcinoma of the spine treated by roentgenotherapy. From his observations in these cases, he feels warranted in presenting the following conclusions:

1. The roentgen-rays when applied properly and in sufficient quantity upon deep-seated cancer tissue, may be expected to destroy the cancer cell, and this cancer cell is replaced by healthy scar tissue or fibrous tissue.

2. As a result of this healing process, the patient's life is prolonged and he is made more comfortable.

3. One cannot expect the patient to make a complete, permanent recovery, for ultimately the disease is apt to show metastases particularly in the areas not treated.

4. It is entirely likely that these metastatic carcinomata of the spine, without other evidence of metastatic involvement, have an unusual amount of natural resistance, and that this increased resistance on the part of the patient helps us greatly in the healing process. It seems likely that many of the patients, or most of them, die of visceral involvement, before there is time enough for symptomatic disease to develop in the spine, and so it is only in more resistant cases that there is time for spinal metastasis.

5. With the clinical and microscopic proof of the destructive action on malignant tissue followed by a healing process, and with the experimental proof of a decrease in malignancy of cancer tissue, which has been exposed to the *x*-ray, and a decrease in its capacity for inoculation, we can recommend most strongly the use of deep roentgenotherapy both as pre-operative treatment to be followed immediately by operation, and as post-operative treatment, given after the proper interval, which should be four weeks after the pre-operative treatment.

Chronic Septic Inflammation in Bone Following Gunshot Wound. W. E. GALLIE, Major, C.A.M.C. *The Journal of Orthopedic Surgery,* August, 1919.

Gallie reviews the older and modern methods of treatment of bone sepsis and chronic osteomyelitis. From previous knowledge and from experiments in bone repair and bone infection in animals, the author presents the following conclusions as regards the mechanism of bone repair and the treatment of bone infections:

1. The periosteum is the medium by which the blood-vessels are distributed to the shafts of the bones. Reflection of the membrane produces superficial necrosis and should never be done when sepsis is present or feared.

2. The periosteum as reflected in an ordinary surgical operation is merely a fibrous tissue membrane and is not osteogenetic. It should therefore never be relied upon to restore the shaft after resection.

3. Mild chronic septic infection is a strong stimulant of inflammatory osteogenesis. It causes widespread osteoporosis, increased vascularity, and abundant callus-formation. This is the state in which cavities are most apt to heal, and fractures to unite, unless prevented by some definite condition such as the presence of sequestra or the existence of too large a gap.

4. When the irritation subsides or disappears, this rarefying osteitis gives place to an intense sclerosis which is very inimical to the healing of cavities or fractures.

5. Treatment should therefore take advantage of the pathological condition which is present at the time the sequestra have separated, and aim at a complete cure before osteosclerosis has supervened. It should consist of the complete excision of the scar and sinus, and the wide removal of the walls of the cavity for the purpose of thorough evacuation of sequestra and unhealthy granulation tissue. All irregularities and pockets must be obliterated, and when possible the depth of the cavity should be reduced by allowing the soft structures to fall into it. Pedunculated muscle- or fascia-flaps are of great assistance in promoting rapid healing. Finally, wide-open drainage must be provided so that the cavity can heal from the bottom without depending on the dangerous alternative of a narrow sinus.

6. Taylor's apparatus is useful in cleansing these wounds before operation and is of great value in the treatment of post-operative sepsis.

7. Non-union in compound fractures, uncomplicated by great loss of bone, is rare. When present, the fact that the wound is septic is no contra-indication to active treatment of the fracture, as well as of the osteomyelitis. Gratifying results may be anticipated from thorough freshening of the ends and adjusting of the fragments, providing efficient drainage is secured.

8. The best time to correct mal-union in septic cases is at the time of the operation for the disease in the bone.